(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 844 012 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
27.05.1998 Bulletin 1998/22

(51) Int. Cl.[6]: **B01D 27/08**, B01D 35/30

(21) Application number: **97118188.8**

(22) Date of filing: **20.10.1997**

(84) Designated Contracting States:
AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV RO SI

(30) Priority: **20.11.1996 JP 309078/96**
09.07.1997 JP 183521/97

(71) Applicant: **DENSO CORPORATION**
Kariya-City Aichi-Pref. 448 (JP)

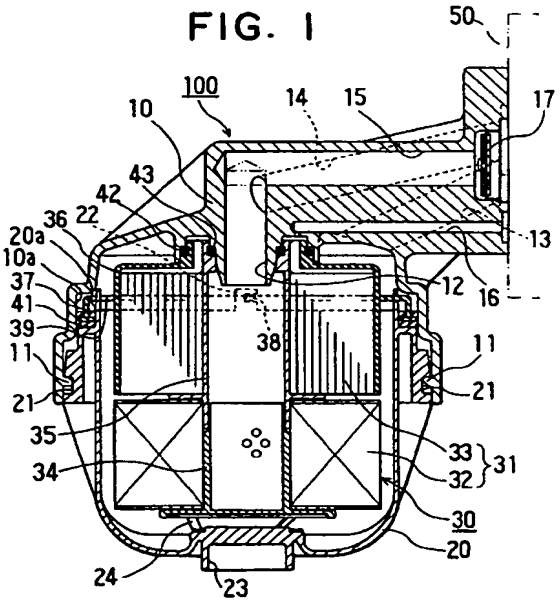
(72) Inventors:
- **Fukumori, Sadahito**
  Kariya-city, Aichi-pref. 448 (JP)
- **Tomita, Masahiro**
  Kariya-city, Aichi-pref. 448 (JP)
- **Yonemoto, Tosiyuki**
  Kariya-city, Aichi-pref. 448 (JP)
- **Ueda, Hiroshi**
  Kariya-city. Aichi-pref. 448 (JP)

(74) Representative:
Pellmann, Hans-Bernd, Dipl.-Ing.
Patentanwaltsbüro
Tiedtke-Bühling-Kinne & Partner
Bavariaring 4
80336 München (DE)

(54) Filter element assembly and element-replaceable type filter equipped with the same

(57) An element-replaceable type filter (100) comprises a base (10, 110) and a cap (20, 120) for accommodating therein an element assembly (30, 130) having a filter element (31, 131) and removably engageable with each other. When replacing the element assembly, the cap is demounted from the base together with the element assembly. At this time, a gasket (41, 141) for maintaining the base and the cap liquid-tightly is also demounted together with the filter element. This construction simplifies the replacing work and reduces failure of mounting the gasket between the base and the cap. The base has a drain port (211) for draining fluid therethrough when the cap is loosened from the base for replacement of the filter element assembly.

FIG. 1



EP 0 844 012 A2

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention:

The present invention relates to a filter element assembly and an element-replaceable type filter enabling the replacement of an element assembly, for example, to an element-replaceable type oil filter arranged to filter impurity and the like which enter into oil for lubricating an internal combustion engine. The present invention further relates to a drain mechanism for an oil filter for an internal combustion engine.

2. Description of Related Art:

Conventionally, as a prior art, a filter element assembly and an element-replaceable type filter equipped with the same are known as disclosed in Japanese Patent Publication Laid-Open No. 7-100309. In this filter, in which when an element-replacing work is performed at a time of maintenance, a gasket (O-ring) mounted-between two casing members having a filter element assembly received therein is also replaced for the maintenance of reliability along with the mounting and demounting of the element assembly. With this prior art, the replacing work of the gasket (O-ring) following the replacement of the element is troublesome, with the result that it is practically impossible to prevent the occurrence of the replacement failure thereof or the mounting failure thereof.

Another prior art is disclosed in European Patent Publication Laid-Open No. 314915. According to this prior art, when a cap including a filter element is loosened for replacing the oil filter element, an oil draining valve is opened by the repulsion of a spring so that the oil is discharged. However, this structure for the draining portion requires the valve and the spring.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a filter element assembly and an element-replaceable type filter which simplifies a replacement or mounting work of a sealing member following the replacement of the element.

It is another object of the present invention to provide a filter having an oil discharge drain which is simple in construction.

According to one aspect of the present invention, a first seal member is mounted on an outer circumferential edge of a support member retaining the end surface or outer circumference of a filter element assembly, and a second seal member is mounted between members located around the filter element separately from the first seal member for partitioning the fluid after the same is filtered and the fluid before the same is filtered. By this arrangement, a seal between these members can be made effective and simultaneously both seal members can be collectively handled along with the element assembly. Preferably, the support member of the element assembly has the passage permitting flow of the fluid and therefore the support member of the element assembly accommodated within two casings does not become an obstacle to the flow direction of the fluid.

According to another aspect of the present invention, a base to which a cap is mounted together with a filter element assembly is provided with a drain port at the open side of a seal member. The seal member between the cap and the base is released to allow fluid to flow out of the drain port when the cap is loosened at the time of replacing the element assembly.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects, features and advantages of the invention will become apparent from the following detailed description when read with reference to the accompanying drawings, in which:

Fig. 1 is a sectional view illustrating an oil filter according to a first embodiment of the present invention;
Fig. 2 is a top surface view of the oil filter shown in Fig. 1;
Figs. 3A and 3B are a plan view and a sectional view illustrating an element support member used in the embodiment, respectively;
Fig. 4 is a sectional view illustrating the oil filter with a cap being separated from a base for a filter element replacement work;
Fig. 5 is a sectional view illustrating the oil filter with an element assembly being detached from the cap in the filter element replacement work;
Fig. 6 is a sectional view illustrating an oil filter according to a modification of the first embodiment of the present invention;
Fig. 7 is a sectional view illustrating an oil filter according to a further modification of the first embodiment of the present invention;
Fig. 8 is a plan view of the oil filter viewed from the oil inlet side;
Fig. 9 is a sectional view of an oil filter according to a second embodiment of the present invention;
Fig. 10 is a sectional view of the oil filter illustrating flow of oil in the second embodiment at an engine running time;
Fig. 11 is a sectional view of the oil filter illustrating flow of oil in the oil filter in the second embodiment at an oil filter replacing time;
Fig. 12 is a partial sectional view of an oil filter according to a modification of the second embodiment; and
Fig. 13 is a partial sectional view of an oil filter according to a further modification of the second

embodiment.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention will be described in detail with reference to its embodiments and modifications shown in the drawings, in which the same or like parts are designated by the same or like numerals.

(First Embodiment)

In Figs. 1 and 2, a reference numeral 100 denotes an element-replaceable type oil filter (hereinafter referred to simply as "oil filter"). The oil filter 100 comprises a base 10 which is made of, for example, aluminum and is concurrently used as a bracket fixed to a mount seat 50 of a cylinder block of an internal combustion engine through a seal member not illustrated and a bottomed cylindrical cap 20, the base 10 and the cap 20 being liquid-tightly connected to and integrated with each other through a gasket 41 serving as a first seal member. It is to be noted that the oil filter 100 of this embodiment is illustrated as having a structure for use in a diesel engine.

The base 10 is provided on an inner cylindrical surface in the vicinity of its end opening with a plurality of protruding portions 11 (at four positions in this Embodiment), is provided on its inner circumferential surface with a seal surface 10a for pressing a gasket 41 and liquid-tightly retaining the same, and is provided at its central part with a protector portion 12 serving concurrently as an oil outlet which liquid-tightly retains an element assembly 30. Also, the base 10 is formed with an inlet side oil passage 13 for permitting flow of dirty oil from the mount seat 50 side of the cylinder block, an outlet side oil passage 14 lead to an oil outlet of the protector portion 12, a relief side oil passage 15 which is intended, when filter elements 31 are clogged and as a result the dirty oil has become unable to pass through the inlet side oil passage 13, to pass the dirty oil therethrough via a relief valve 17, and further a bypass oil passage 16 for passing clean oil filtered by a bypass element 33 of the filter elements 31 and returning the clean oil to the internal combustion engine side. It is to be noted that the inlet side oil passage 13 of the base 10 and the relief side oil passage 15 are communicated with each other on the mount seat 50 side of the cylinder block.

On the other hand, the cap 20 is provided in a cylindrical outer circumferential surface in the vicinity of its end opening with a plurality of groove portions 21 (at four positions in this embodiment) which are engaged with the protruding portions 11 of the base 10, is provided on its open end with a plurality of claw portions 22 for being engaged with a horizontal beam portion 38 of an element support member 36 for retaining the bypass element 33 as later described which constitutes the element assembly 30, is provided on its cylindrical outer circumferential surface between the groove portion 21 and the claw portion 22 with a seal surface 20a for pressing the gasket 41 and liquid-tightly retaining the same, and is provided in its vertex outer surface with a tool hole 23 to which a filter mounting/demounting tool is to be attached. In this way, the base 10 and cap 20 of this embodiment are connected together with the use of a bayonet system utilizing the protruding portions 11 and the groove portions 21.

Within this oil filter 100, there is received the element assembly 30 in a state of its being urged from the cap 20 side to the base 10 side by a spring member 24. The element assembly 30 has the filter element unit 31 in which a full flow element 32 provided by bending filter paper into a cylindrical configuration and intended to filter relatively coarse impurities entered into the oil by utilizing the thickness direction of the filter paper and the bypass element 33 provided by winding filter paper into a roll configuration and intended to filter relatively fine particles such as carbon particles entered into the oil by causing the oil to pass therethrough in the axial direction are combined together in such a way as to be piled up one over the other. At the center side of the full flow element 32 of this filter element unit 31 there is disposed a protector member 34 formed in its cylindrical surface with a plurality of openings serving as oil passages. At the center side of the bypass element 33 of the filter element unit 31 there is disposed a protector member 35 whose hollow cylinder is interiorly used as an oil passage, the protector members 34 and 35 being respectively inserted into the filter elements 31 and connected together. The element support member 36 is fitted over the upper surface and outer circumferential surface of the bypass element 33 of the filter element unit 31 and an upper opening side thereof is inserted over the protector member 35 and integrated therewith.

The element assembly 30 having the above-described construction has an O-ring 42 mounted thereon and serving as a second seal member used for partitioning and an O-ring 43 serving as a second seal member used for partitioning in such a way that the O-ring 42 is mounted on an outer circumferential edge of the upper open end of the element support member 36 and the O-ring 43 is mounted on an inner circumferential edge of the upper open end of the protector member 35. The element assembly 30 is liquid-tightly retained, through the O-rings 42 and 43, on the cylindrical outer circumferential surface of the protector portion 12 of the base 10. It is to be noted that in the following description the filter element assembly is referred to as element S/A (sub-assembly).

As illustrated in Figs. 3A and 3B, from a cylindrical outer circumferential surface of the element support member 36 there are made to radially protrude a plurality of horizontal beam portions 38 (at twelve positions in this Embodiment) at forward ends of which there is supported and integrally formed a ring-shaped gasket sup-

port portion 37. A forward end of this gasket support portion 37 is formed into a T-like configuration and, on this forward end thereof, there is mounted a gasket 41 having a retention configuration conforming to that configuration and serving as a first seal member for making a seal between the base 10 and the cap 20. Here, between the cylindrical outer circumferential surface of the element support member 36 and the gasket support portion 37, except for the horizontal beam portions 38 for supporting the gasket support portion 37, there is formed a passage 39 through which the dirty oil delivered through the inlet side oil passage 13 is permitted to pass to reach the filter element 31.

Next, the work performed when replacing the element S/A 30 within the oil filter 100 will be explained with reference to Figs. 1, 4 and 5. It is to be noted that Fig. 4 is a sectional view illustrating a state where the cap 20 has been demounted from the oil filter 100 of Fig. 1 and Fig. 5 is a sectional view illustrating a state where the element S/A 30 has been demounted from the cap 20 of Fig. 4.

In Fig. 1, the outer surface of a vertex portion of the cap 20 is gripped with the fingers and then the groove portion 21 of the cap 20 connected to the protruding portion 11 of the base 10 is rotated. Or, with the use of the tool hole 23 provided in the vertex outer surface of the cap 20, the groove portion 21 of the cap 20 connected to the protruding portion 11 of the base 10 is rotated using a tool not illustrated. With this rotation, the connection of the cap 20 to the base 10 is gradually released, whereby the cap 20 is moved and separated from the base 10. At this time, the cap 20 is moved in a state where the claw portion 22 provided on an open end thereof has been engaged with the horizontal beam portion 38 of the element support member 36 of the element S/A 30.

As illustrated in Fig. 4, the state of connection between the cap 20 and the base 10 is completely released with the result that the cap 20 is separated from the base 10 together with the element S/A 30. Then, the gasket 41 mounted between the base 10 and the cap 20, i.e., mounted at the gasket support portion 37 of the element support member 36 of the element S/A 30 and serving to liquid-tightly maintain the interior of the oil filter 100 is also separated from a seal surface 10a of the base 10. At this time, the O-ring 42 mounted on an outer circumferential edge of the upper open end of the element support member 36 of the element S/A 30 and the O-ring 43 mounted on an inner circumferential edge of the upper open end of the protector member 35 are respectively separated from the base 10. In this state of disconnection between the base 10 and the cap 20, the element S/A 30 still remains to be received within the cap 20.

Thereafter, by rotating the element S/A 30 through an angle at which the horizontal beam portion 38 thereof is disengaged from the claw portion 22 of the cap 20, as illustrated in Fig. 5 the element S/A 30 can be demounted from inside the cap 20 separated from the base 10. At this time, the element S/A 30 still keeps the gasket 41 thereon for liquid-tightly maintaining the base 10 and the cap 20 as well as the O-rings 42 and 43 for partitioning a dirty oil side and a clean oil side within the oil filter 100. Therefore, it results that all of the seal members needed to be simultaneously replaced in order to maintain the reliability of the oil filter 100 are taken out along with the element S/A 30.

Next, a new element S/A 30 having the gasket 41 and O-rings 42 and 43 as new seal members mounted thereon beforehand is inserted into the cap 20 against the urging force of the spring member 24. As a result of this, the gasket 41 mounted on the gasket support portion 37 of the element support member 36 of the element S/A 30 is inserted over the seal surface 20a at the outer circumferential edge of the open end of the cap 20. The element S/A 30 is rotated relative to the cap 20, whereby the horizontal beam portion 38 of the element support member 36 thereof is engaged with the claw portion 22 of the cap 20. As a result, the new element S/A 30 is set in the cap 20 (Fig. 4).

Next, the cap 20 in which the new element S/A 30 has been set is inserted into the base 10 in such a way that the groove portion 21 may oppose the protruding portion 11 thereof and this cap 20 is rotated in the direction opposite to that in which the cap 20 is rotated when being separated from the base 10. At this time, the outer circumferential surface of the gasket 41 is inserted into the seal surface 10a of the base 10, with the result that the base 10 and the cap 20 are liquid-tightly maintained. Also, by the O-rings 42 and 43 being inserted over the outer circumferential surface of the protector portion 12 of the base 10, the interior of the oil filter 100 is partitioned into a dirty oil before filtering and a clean oil after filtering by means of the protector members 34, 35 and O-rings 42, 43 of the element S/A 30.

Next, the path along which the dirty oil is filtered passing through the oil filter 100 after coming out from the side of the mount seat 50 of the cylinder block of the internal combustion engine will be explained with reference to Fig. 1.

In Fig. 1, when the internal combustion engine is in work and the filter elements 31 of the element S/A 30 received within the oil filter 100 have a sufficiently high level of filtering ability, there is formed an oil flow passage which permits the dirty oil delivered from the internal combustion engine side to pass from the inlet side oil passage 13 of the base 10 into the filter elements 31 through the passage 39 of the element support member 36.

The clean oil which has been filtered passing through the full flow element 32 of the filter elements 31 flows along an oil flow passage which is formed extending from the interior of a hollow cylinder of the protector member 34 and the interior of a hollow cylinder of the protector member 35 to the internal combustion engine side via the protector portion 12 of the base 10 and via

the outlet side oil passage 14. Also, the clean oil which has been filtered passing through the bypass element 33 of the filter element 31 flows along an oil flow passage which is formed extending between the protector member 35 and the element support member 36 to the internal combustion engine side via the bypass oil passage 16. At this time, the relief valve 17 is not operated against its urging force and so is not made open from its closed state.

On the other hand, when the filter elements 31 of the element S/A 30 are clogged and their filtering ability is extremely lowered with the result that the pressure of the dirty oil delivered from the internal combustion engine side becomes increased up to a prescribed or more than prescribed level, the relief valve 17 disposed at an entrance to the relief side oil passage 15 communicated with the inlet side oil passage 13 is operated and thereby is brought to its opened state from its closed state. For this reason, the dirty oil flows along an oil passage extending through the relief side oil passage 15 and then extending from the outlet side oil passage 14 to the internal combustion engine side without being filtered by the filter elements 31.

As mentioned above, the element S/A 30 of this embodiment has the filter elements 31 for filtering oil. It comprises the O-rings 42 and 43 which partition the oil before and after filtering by the filter elements 31 and thus serve as the seal members, the element support member 36 which retains the end surface or outer circumference of the filter elements 31, and the gasket 41 which is mounted on the gasket support portion 37 provided on the outer circumference of the element S/A 30 by the element support member 36 and serves as the seal member. That is, since the O-rings 42 and 43 and the gasket 41 are collectively handled along with the element S/A 30, it is possible to remarkably enhance the working efficiency.

Also, in the element S/A 30 of this embodiment, the element support member 36 has the passages 39 through which oil passes. Accordingly, since the element support member 36 does not become an obstacle to the flow direction of oil, it is possible to increase the degree of freedom in design in the end surface or outer circumference of the filter elements 31.

In the element S/A 30 of this embodiment, the gasket 41 serving as the seal member is provided separately from the protector members 34, 35 for partitioning the oil before and after filtering by the filter elements 31 and the O-rings 42, 43 as the seal members. Therefore, since the seal needed between a casing constituted by the base 10 and the cap 20 and the element S/A 30 and the seal needed between the base 10 and the cap 20 constituting the casing are provided separately, the resulting element S/A 30 of this Embodiment is suitable for the element-replaceable type filter adopting the cylindrical filter elements 31.

Further, the oil filter 100 as the element-replaceable type filter according to this embodiment comprises the element S/A 30 having the element support member 36 retaining the end surface or outer circumference of the filter elements 31 for filtering oil and the gasket 41 mounted on the outer c-ircumferential edge of the element support member 36 and serving as the seal member, and the casing freely dividable into the base 10 as a first casing portion and the cap 20 as a second casing portion and having the gasket 41 disposed at its position connecting the both casing portions and having the element S/A 30 freely receivable therewithin, the casing being composed of the base 10 and the cap 20.

Accordingly, by releasing the connection between the base 10 and the cap 20, the element S/A 30 can be demounted and also the gasket 41 can be demounted, thus the element-replacing work efficiency can be remarkably enhanced.

Further, the oil filter 100 as the element-replaceable type filter according to this embodiment is so arranged as for the element support member 36 of the element S/A 30 to have the passages 39 through which oil passes. Accordingly, the element support member 36 of the element S/A 30 received within the base 10 and cap 20 does not become an obstacle to the flow direction of oil. Therefore, it is possible to increase the degree of freedom in design in the end surface or outer circumference of the filter elements 31.

In addition, in the oil filter 100 as the element-replaceable type filter according to this embodiment, the gasket 41 serving as the seal member of the element S/A 30 is provided separately from the protector members 34, 35 for partitioning the oil before and after filtering by the filter elements 31 and the O-rings 42 and 43 as the seal members. Therefore, since the seal needed between the casing constituted by the base 10 and the cap 20 and the element S/A 30 and the seal needed between the base 10 and the cap 20 constituting the casing are provided separately, the resulting oil filter is suitable for the element-replaceable type filter adopting the cylindrical filter elements 31.

Also, the oil filter 100 as the element-replaceable type filter according to this embodiment has a spatial portion which has the seal surfaces 10a and 20a of the both casing portions comprising the base 10 and the cap 20 and in which the gasket 41 is accommodated. This gasket accommodation spatial portion is communicated with the interior of the casing through a communication opening by which the gasket support portion 37 is received. Accordingly, the base 10 and the cap 20 which accommodate the element S/A 30 therein are reliably sealed by disposing the gasket 41 in the spatial portion provided at the position of their connection to each other.

In addition, in the oil filter 100 as the element-replaceable type filter according to this embodiment, the one side cap 20 of the both casing portions has the claw portion 22 which serves as the engagement portion engaged with and moving the horizontal beam portion 38 constituting part of the element support member 36.

Accordingly, by the claw portion 22 provided on the cap 20 being engaged with the horizontal beam portion 38 of the element support member 36 for supporting the element S/A 30, the element S/A 30 can be demounted from the base 10 simultaneously with the demounting work of the cap 20.

Although in the above-described embodiment as the element-replaceable type filter reference has been made to the oil filter, in a case where carrying out the invention, the oil filter is not limitative and the invention may be applied to the element-replaceable type fuel filter.

Also, although in the above-described embodiment reference has been made such that the protruding portion 11 of the base 10 and the groove portion 21 of the cap 20 are connected together, instead of the above-described construction the protruding portion may be provided on the cap side and the groove portion may be provided on the case side. In addition, the base 10 and the cap 20 are each not limited to being made of aluminum and may be made of resin.

The first embodiment may be modified as shown in Fig. 6. In Fig. 6, in the oil filter 100, the casing is constituted by the base 10' fixed through the seal member not illustrated to the mount seat 50 of the cylinder block of the internal combustion engine and the bottomed cylindrical cap 20'. The base 10' and the cap 20' are liquid-tightly connected to each other through the gasket 41 and integrated with each other. A threaded portion 11' is provided on the cylindrical inner surface in the vicinity of the end opening of the base 10' while, on the other hand, a threaded portion 21' which is to be brought into screw engagement with the threaded portion 11' of the base 10' is provided on the cylindrical outer circumferential surface in the vicinity of the end opening of the cap 20'. In this way, the base 10' and the cap 20' in this embodiment are connected together by using a so-called screw system based on the use of the threaded portions 11' and 21'.

Although the element S/A 30 contained in the oil filter 100' is constructed in the same way as in the above-described embodiment, no claw portion is provided on the open end of the cap 20'. For this reason, when the cap 20' has been demounted from the base 10' by being rotated relative thereto, the element S/A 30 is kept retained, through the O-rings 42 and 43, on the cylindrical outer circumferential surface of the protector portion 12 of the base 10'. Thereafter, the element S/A 30 is released therefrom by its own weight or is demounted by an operator. This construction is effective when bringing the base 10' and the cap 20' into screw engagement with each other. According to this embodiment, there can be obtained the same function and effect as in the above-described embodiment which make it possible to replace the gasket 41 simultaneously with the replacement of the element S/A 30.

The first embodiment may be modified further as shown in Fig. 7. The oil filter 100 is constructed such that a casing thereof is constituted by a base 110 integral with the cylinder block of the internal combustion engine and a bottomed cylindrical cap 120 made of, for example, aluminum, whereby the base 110 and the cap 120 are liquid-tightly connected to each other through a gasket 141 and thereby integrated with each other. It is to be noted that the oil filter 100 of this embodiment is illustrated as having a full flow type of structure for a gasoline engine.

The base 110 is provided with a threaded portion 111 on the cylindrical inner surface in the vicinity of its end opening, is provided on its inner circumferential surface with a seal surface 110a for pressing the gasket 141 and liquid-tightly retaining the same, is provided in its inner circumferential surface with an inlet side oil passage 113 serving as an oil inlet, and is provided at its central part with a protector portion 112 for liquid-tightly retaining the element S/A 130, which serves as an oil outlet.

Within this oil filter 100 there is accommodated the element S/A 130 having a filter element 131 provided by bending filter paper into a cylindrical configuration, such that one of its both end openings is fitted to a protector member 134 and integrated therewith and is inserted onto a cylindrical outer circumferential surface of a protector member 135 whose outer circumferential surface is shaped in cross section like a spur gear and the other thereof is liquid-tightly inserted onto a cylindrical outer circumferential surface of the protector 112 formed integrally with the base 110 side and partly having a slot-shaped notch. On the oil inlet side of the element S/A 130 there is located a gasket support member 132 bonded integrally to the filter element 131 and concurrently serving as an end plate. As illustrated in Fig. 8, in this gasket support member 132 there are formed passages 132a of a prescribed configuration so that dirty oil can pass therethrough. The gasket 141 is inserted over the outer circumferential edge of the gasket support member 132. The other end side of the filter element 131 is closed by an end plate 133. A cushion material 142 serving as a second seal member is adhered on the edge of a central end opening of the gasket support portion 132. Similarly, a cushion material 143 serving as a second seal member is also adhered on the edge of a central end opening of the end plate 133.

Also, a conical spring member 124 consisting of a plate spring member is fixed to the vertex inner surface of the cap 120. By this spring member 124, the element S/A 130 is pressed against the base 110 through the protector member 134. On an inside end surface of the inlet side oil passage 113 of the base 110 permitting entry thereinto of dirty oil delivered from the internal combustion engine side there is disposed an anti-drain valve (check valve) 160 composed of a rubber-made valve member 161 and a metallic spring member 162 for assisting the opening/closing work of this valve member 161. For this reason, as later described, when the internal combustion engine is in work and the filter

element 131 of the element S/A 130 accommodated within the oil filter 100 has a sufficiently high level of filtering ability, there is formed an oil flow passage which permits dirty oil delivered from the internal combustion engine to flow from the inlet side oil passage 113 to the filter element 131 through the anti-drain valve 160 and through the passages 132a of the element S/A 130. Also, when the internal combustion engine is stopped, the anti-drain valve 160 becomes closed with the result that the oil flow passage is shut off.

The cross section of the inner circumference of the protector member 135 is also shaped like a gear and a plate 171 is slidably disposed at the end of the inner circumference thereof. The plate 171 constitutes a relief valve 170 by being caused to abut against a seat surface of the protector member 134 by the urging force of a spring 172 to provide a sealed state between the two. This protector member 134 has an oil passage hole 134a formed at its central part. When as later described the filter element 131 of the element S/A 130 accommodated within the oil filter 100 is clogged and as a result its filtering ability is extremely lowered with the result that the pressure of dirty oil rises up to a prescribed or higher than prescribed level, the plate 171 of the relief valve 170 becomes opened from its closed state against the urging force of the spring 172. Then, an oil flow passage is formed which extends from the oil passage hole 134a of the protector member 134, relief valve 170, interior of the circular hollow cylinder of the protector member 135 and protector portion 112 of the base 110 to the internal combustion engine through the outlet side oil passage 114.

Next, the work performed when replacing the element S/A 130 within the oil filter 100 will be explained with reference to Fig. 7.

In Fig. 7, the outer surface of a vertex portion of the cap 120 is gripped with the fingers and then the threaded portion 121 of the cap 120 connected to the threaded portion 111 of the base 110 is rotated. With this rotation, the connection of the cap 120 to the base 110 is gradually released, whereby the cap 120 is moved and separated from the base 110.

The state of connection between the cap 120 and the base 110 is completely released with the result that the cap 120 is separated from the base 110 side. In this state of disconnection between the base 110 and the cap 120, the element S/A 130 still remains received within the base 110 as is. Thereafter, the element S/A 130 can be demounted together with the protector members 134 and 135. Then, the gasket 141 mounted between the cap 120 and the base 110, i.e., mounted on the outer circumferential edge of the gasket support portion 132 of the element S/A 130 and intended to liquid-tightly maintain the interior of the oil filter 100 and serving as the seal members needed to be simultaneously replaced in order to maintain the reliability of the oil filter 100 is also released from the seal surface 110a of the base 110.

Next, a new element S/A 130 having the gasket 141 as a new seal member mounted thereon beforehand and having the protector members 134 and 135 inserted thereinto is inserted into the base 110. As a result of this, the gasket 141 mounted on the gasket support member 132 of the element S/A 130 is inserted into the seal surface 110a formed on the inner circumference of the base 110. At this time, a central hole of the gasket support member 132 of the element S/A 130 is inserted over the protector 112 of the base 110. The cap 120 in which the new element S/A 130 has been set is operated such that the threaded portion 121 thereof and the threaded portion 111 of the base 110 are rotated in the direction opposite to that in which each of them is rotated when the cap 120 is separated from the base 110. At this time, the element S/A 130 is pressed against the base 110 side through the protector member 134 by the spring member 124 fixed to the cap 120 side. The gasket 141 mounted on the outer circumferential edge of the gasket support member 132 of the element S/A 130 is pressed against the seal surface 110a of the base 110 by the open end surface of the cap 120, with the result that the base 110 and the cap 120 are maintained to be liquid-tight.

Next, the path along which the dirty oil is filtered passing through the oil filter 100 after coming out from the base 110 side of the cylinder block of the internal combustion engine will be explained with reference to Fig. 7.

In Fig. 7, when the internal combustion engine is in work and the filter elements 131 of the element S/A 130 received within the oil filter 100 have a sufficiently high level of filtering ability, there is formed an oil flow passage which permits the dirty oil delivered from the internal combustion engine side to pass from the inlet side oil passage 113 of the base 110 into the filter elements 131 through the anti-drain valve 160 and the passages 132a of the gasket support member 132 of the element S/A 130.

The clean oil which has been filtered passing through the filter element 131 flows along an oil flow passage which is formed in such a way as to extend through the outer circumferential portion of the protector member 135 and the partial slot-shaped notch of the protector portion 112 of the base 110 and then through the outlet side oil passage 114 to the internal combustion engine. At this time, the plate 171 of the relief valve 170 is not operated against the urging force of the spring 172 and so is not made open from its closed state.

On the other hand, when the filter elements 131 of the element S/A 130 are clogged and its filtering ability is extremely lowered with the result that the pressure of the dirty oil delivered from the internal combustion engine side becomes increased up to a prescribed or more than prescribed level, the relief valve 170 is operated and thereby is brought to its opened state from its closed state. For this reason, the dirty oil flows along an

oil flow passage which is formed in such a way as to extend through the interior of the circular hollow cylinder of the protector member 135 and then through the outlet side oil passage 114 to the internal combustion engine side without being filtered by the filter element 131.

As mentioned above, the element S/A 130 of this embodiment has the filter element 131 for filtering oil. It comprises the gasket support member 132 retained by the end surface of the filter element 131 and extended radially outwardly from the filter element 131, and the gasket 141 which is mounted on the outer circumferential edge of the gasket support member 132 and serves as the seal member. Accordingly, since the gasket 141 is collectively handled together with the element S/A 130, it is possible to remarkably enhance the operating efficiency.

Also, in the element S/A 130 of this embodiment, the gasket support member 132 has the passages 132a through which oil passes. Accordingly, since the gasket support member 132 does not become an obstacle to the flow direction of oil, it is possible to increase the degree of freedom in design in the end surface of the filter element 131.

In the element S/A 30 of this embodiment, the gasket 141 serving as the first seal member is provided separately from the protector members 134, 135 for partitioning the oil before and after filtering by the filter element 131 and the cushion members 142 and 143 serving as the second seal members.

Further, the oil filter 100 as the element-replaceable type filter according to this embodiment comprises the element S/A 130 having the gasket support member 132 retained by the end surface of the filter element 131 for filtering oil and the gasket 141 mounted on the outer circumferential edge of the gasket support member 132 and serving as the seal member, and the casing freely dividable into the base 110 as a first casing portion and the cap 120 as a second casing portion and having the gasket 141 disposed at its position connecting the both casing portions and having the element S/A 130 freely receivable therewithin, the casing being composed of the base 110 and the cap 120.

Accordingly, by releasing the connection between the base 110 and the cap 120, the element S/A 130 can be demounted and also the gasket 141 can be demounted, thus the element-replacing work efficiency can be remarkably enhanced.

Further, the oil filter 100 as the element-replaceable type filter according to this embodiment is so arranged as for the gasket support member 132 of the element S/A 130 to have the passages 132a through which oil passes. Accordingly, the gasket support member 132 of the element S/A 130 received within the base 110 and cap 120 does not become an obstacle to the flow direction of oil. Therefore, it is possible to increase the degree of freedom in design in the end surface of the filter element 131.

In addition, in the oil filter 100 as the element-replaceable type filter according to this embodiment, the gasket 141 serving as the first seal member of the element S/A 130 is provided separately from the protector members 134, 135 for partitioning the oil before filtering by the filter element 131 and the oil after filtering by the filter element 131 and the cushion members 142, 143 serving as the second seal members.

Also, the oil filter 100 as the element-replaceable type filter according to this embodiment has a spatial portion which has the seal surfaces 110a and 120a of both casing portions consisting of the base 110 and the cap 120 and in which the gasket 141 is accommodated. This gasket accommodation spatial portion is communicated with the interior of the casing through a communication opening by which the gasket support portion 132 is received. Accordingly, the base 110 and the cap 120 which accommodate the element S/A 130 therein are reliably sealed by disposing the gasket 141 in the spatial portion provided at the position of their being connected to each other.

Meanwhile, although in the above-described embodiment as the element-replaceable type filter reference has been made to the oil filter, in a case where carrying out the invention, the oil filter is not limitative and the invention may be applied to the element-replaceable type fuel filter. In addition, the cap 120 is not limited to being made of aluminum and may be made of resin.

Although in the embodiment of Fig. 7 it has been arranged that the casing is divided into the two bottomed cylindrical casing portions, it may be arranged that the casing is composed of a first bottomed cylindrical casing portion and a second circular-plate shaped casing portion which closes the end opening of the first casing portion. In this case, although in the embodiment of Fig. 7 the gasket support member 132 is disposed on the internal combustion engine side of the element S/A, this gasket support member 132 may be disposed on a side remote from the internal combustion engine, i.e., on the upside end surface of the illustration. According to this disposition, since it is not needed to cause oil to flow through the gasket support member, it is possible to eliminate the necessity of providing the passages 132a. However, even in this case, it is important that the gasket support member be provided in such a way as to extend radially outwardly from the filter element and that the gasket be supported on the extended portion thereof. It is also important that the gasket be received between the two axially dividable casing portions to thereby provide a seal between these two casing portions.

(Second Embodiment)

In the second embodiment, shown in Figs. 9, 10 and 11, a base 201 is provided at an engine block and has a portion, as formed of a cylindrical wall 217 and a bottom face portion 218, for mounting a cap 202. From

the center of the bottom face portion 218, moreover, there is protruded an outlet 215 providing an oil outlet passage to engine sliding portions. In the circumferentially outer side of the outlet 215, there is formed a bypass hole 216 providing an outlet passage of the bypass oil to an oil pan (not shown). In the further circumferential outside, there is formed an inlet 214 providing an oil inlet passage. From the lower portion of the cylindrical wall 217, there is so protruded a drain port 211 providing an oil discharge passage for replacing the oil filter as to extend from the inner face of the cylindrical wall 217 to the outside. In the uppermost portion of the cylindrical wall 217 with respect to the drain port 211, on the other hand, there is provided a groove 212 for feeding the air into the housing when the oil is to be drained.

The cap 202 is made of a bottomed cylindrical container and is arranged in the cylindrical wall 217. These cap 202 and cylindrical wall 217 are joined by a joint portion which is composed of a projection and a groove constructing the bayonet mechanism. In the cap 202, there is mounted a filter element subassembly (S/A) 205 which is composed of a main or full filter element 206, a bypass filter element 207, a relief valve 208, seal members 209 and 210 forming a bypass flow circuit, and a seal member 204 sandwiched between the inlet 214 and the drain port 211.

The element S/A 205 is inserted and fixed in the cap 202. At the element replacing time, the element S/A 205 is extracted out of the cap 202, and a new element S/A 205 is inserted again. On this new element S/A 205, there are supported the seal members 204, 209 and 210 which play important roles to seal the base 201 and the cap 202 and to define the bypass passage, so that the seal members can be replaced by new ones together with the element S/A 205.

When the cap 202 is mounted on the base 201, the bypass is defined by the seal members 209 and 210. The seal member 210 seals the seal portion of the element S/A 205 and the seal portion of the outer circumferential wall of the protrusion of the outlet 215 when it comes into contact with the two seal portions. The seal member 209 seals the seal portion of the element S/A 205 and the annular seal portion formed in the bottom face portion 218, when it is sandwiched inbetween at a position between the bypass hole 216 and the inlet 214. The seal member 204 keeps the seal between the outer circumferential face acting the seal portion of an annular projection 220, as formed at the circumferentially outer side of the inlet 214 formed in the bottom face portion 218, and the seal portion of the element S/A 205. The seal member 204 also keeps the seal between the seal portion of the element S/A 205 and the seal portion of the cap 202. As a result, the seal member 204 seals the seal portion of the projection 220 and the seal portion of the cap 202.

On the outer side of the cylindrical portion of the cap 202, there is fitted a seal member 213 which seals it and the seal portion of the inner face of the cylindrical wall 217. Thus, the oil is prevented from flowing out of the open end of the cylindrical wall 217. Here, the seal member 213 is located at the side close to the bottom face portion 218 than a groove 212, when the cap 212 is mounted on the base 201, and at a position over the groove 212 when the cap 202 is loosened.

On the other hand, the seal members 204, 210 and 213 are exemplified by O-rings, and seal means including those seal members constructs a cylindrical seal because one of the seal portions is given a cylindrical face. In this cylindrical seal, at least one of the opposing faces of the inner and outer overlapping cylindrical portions is formed into the cylindrical face, and the seal member is held in contact with the cylindrical face to effect the seal between the two cylindrical portions while allowing the two cylindrical portions axially along that cylindrical face. This cylindrical seal can be ensured even with a fine axial distortion in the cylindrical face.

Especially in the embodiment of Fig. 9, the seal means for sealing the base 201 and the cap 202 is constructed of the seal member 204 made of the O-ring, the outer circumference of the projection 220 acting as the seal portion at the side of the base 201, and the inner side face of the open end acting as the seal portion at the side of the cap 202. In this embodiment, therefore, the cylindrical seal is made by forming both the outer circumference of the projection 220 and the inner side face of the open end of the cap 202 into the cylindrical faces. Here, one of them may be given a cylindrical face.

Fig. 10 illustrates flows of the engine oil at the running time. Since the base 201 and the element S/A 205 are sealed with the seal member 204, the oil, as introduced from the inlet 214, can be prevented from flowing out of the drain port 211 and the open end of the cylindrical wall 217 of the base 201. Since the seal members 209 and 210 isolate the inlet 214, the outlet 215 and the bypass hole 216 individually, moreover, they block the oil flows between the inlet 214 and the bypass hole 216 and between the bypass hole 216 and the outlet 215. As a result, the engine oil flows in through the inlet 214, and its portion is fed through the main filter element 206 from the outlet 215 to the engine sliding portions whereas the remainder is discharged through the bypass filter element 207 from the bypass hole 216 into the oil pan. When the main filter element 206 is clogged, the relief valve 208 is opened so that the oil is bypassed to the outlet 215.

Fig. 11 illustrates the flows of the oil when the cap 202 is removed at an engine stop so as to replace the element S/A 205. As the cap 202 is turned to release the joint between the base 201 and the cap 202, the seal members 204, 209 and 210, as supported by the element S/A 205 inserted and fitted in the cap 202, are carried together with the cap 202 rightward. As a result, the seal members 204, 209 and 210 are brought away from the seal portion at the side of the base 201 so that the seal is released. In this state, the cap 202 is in

engagement with the base 201 so that it does not come out. Moreover, the oil in the inlet 214, the outlet 215 and the cap 202 is discharged, as indicated by arrows, from the drain port 211. As the cap 202 is then further turned, it is removed from the base 201. This makes it possible to prevent the oil from flowing out of the open end of the cylindrical wall 217 of the base 201 when the cap 202 is removed.

Here, between the cylindrical wall 217 of the base 201 and the cap 202, there is interposed the seal member 213 for preventing the oil from flowing out of the open end of the cylindrical wall 217. As a result, the oil does not flow out of the open end of the cylindrical wall 217 when it is discharged from the drain port 211. Above the drain port 211, moreover, there is formed the groove 212 as an air vent, which is shut out when the cap 202 is mounted in the base, so that no air flows in. When the cap 202 is loosened at the oil filter replacing time, the air vent is opened to eliminate the pressure difference between the inside and outside of the housing, so that the oil can be promptly discharged from the drain port 211.

The second embodiment may be modified as shown in Figs. 12 and 13. In the modification shown in Fig. 12, a drain port 219 is formed as a passage to the oil pan in the engine block. The oil is drained to the outside in the second embodiment but to the oil pan in this modification. As a result, there is realized a drain mechanism which is freed from blotting the outside. In the further modification shown in Fig. 13, on the other hand, not by providing the seal member 213 for preventing the oil outflow from the open end of the cylindrical wall 217 but by reducing the gap between the cylindrical wall 217 of the base 201 and the cylindrical portion of the cap 202, the oil is prevented from flowing out of the open end.

Here, the base 201 is constructed at the engine block in the foregoing embodiments, but the construction may be modified such that the base 201 is formed into a bracket to be attached to the engine block.

The present invention should not be limited to the disclosed embodiments and modifications but may be further modified or altered without departing from the spirit of the invention.

An element-replaceable type filter (100) comprises a base (10, 110) and a cap (20, 120) for accommodating therein an element assembly (30, 130) having a filter element (31, 131) and removably engageable with each other. When replacing the element assembly, the cap is demounted from the base together with the element assembly. At this time, a gasket (41, 141) for maintaining the base and the cap liquid-tightly is also demounted together with the filter element. This construction simplifies the replacing work and reduces failure of mounting the gasket between the base and the cap. The base has a drain port (211) for draining fluid therethrough when the cap is loosened from the base for replacement of the filter element assembly.

Claims

1. A filter element assembly having a filter element for filtering fluid, comprising:

   a filter element (31, 131);
   a support member (36, 37, 38; 132) provided on an end surface or outer circumference of the filter element;
   a first seal member (41; 141) mounted on an outer circumferential edge of the support member; and
   a second seal member (42, 43; 142, 143) for partitioning the fluid before and after filtering by the filter element.

2. The filter element assembly as set forth in claim 1, wherein the support member (36, 37, 38; 132) has a passage (39; 132a) permitting flow of the fluid therethrough.

3. An element-replaceable type filter comprising:

   a casing (10, 20; 110, 120) freely dividable into a first casing portion (10; 110) and a second casing portion (20; 120);
   a filter element assembly (30; 130) disposed in the casing and having a support member (36, 37, 38; 132) provided on an end surface or outer circumference of a filter element (31; 131) for filtering a fluid, a first seal member (41; 141) mounted on an outer circumferential edge of the support member, and a second seal member (42, 43; 142, 143) for partitioning the fluid before and after filtering by the filter element, the first seal member being disposed at a position of connecting both casing portions to each other.

4. The element-replaceable type filter as set forth in claim 3, wherein the support member of the filter element assembly has a passage (39; 132a) permitting flow of the fluid therethrough.

5. The element-replaceable type filter as set forth in claim 3 or 4, wherein both casing portions have a space within which the first seal member is disposed and have a communication opening (13 - 16; 113, 114) which permits the communication between the space and the interior of the casing and by which the second support member is received.

6. The element-replaceable type filter as set forth in any one of claims 3 to 5, wherein one of both casing portions has an engagement portion which engages a part of the support member to thereby move the support member.

7. The element-replaceable type filter as set forth in any one of claims 3 to 6, wherein the first casing portion is integral with an engine and the second casing portion is detachably engaged with the first casing portion.

8. The element-replaceable type filter as set forth in claim 7, wherein the support member and the first seal member is detachable together with the second casing portion from the first casing portion.

9. The element-replaceable type filter as set forth in claim 8, wherein the second seal member is detachable together with the second casing portion from the first casing portion.

10. The element-replaceable type filter as set forth in claim 9, wherein the first seal member and the second seal member are detachable from the second casing portion.

11. An oil filter comprising:

a bottomed cylindrical cap (202);
a base (201) having a mounting portion (217) for mounting the cap;
a first seal member (213) for providing a seal between the cap and the base; and
a drain port (211) formed in the base at a side closer to a bottom side of the mounting portion than the first seal member.

12. The oil filter as set forth in claim 11, further comprising:

a second seal member (210) for providing a seal between an outlet (215) formed in the base and an element assembly (205) mounted in the cap.

13. The oil filter as set forth in claim 11 or 12, further comprising:

a third seal member (204, 209) disposed closer to the bottom side of the mounting portion than the drain port for providing a seal between the cap and the base.

14. The oil filter as set forth in claim 11 or 12, wherein a small gap is formed between the cap and the mounting portion of the base.

15. The oil filter as set forth in any of claims 11 to 14, wherein the mounting portion has a groove (212) formed closer to its top side than the drain port and acting as an air vent.

16. The oil filter as set forth in any of claims 11 to 15, wherein the first seal member is shaped cylindrically.

17. A base for an oil filter comprising:

a mounting portion (217) for mounting a cap (202) together with a filter element (206, 207);
a seal portion (213) provided on the mounting portion for sealing between the mounting portion and the cap; and
a drain port (211) formed at a side closer to a bottom of the mounting portion than the seal portion.

FIG. 1

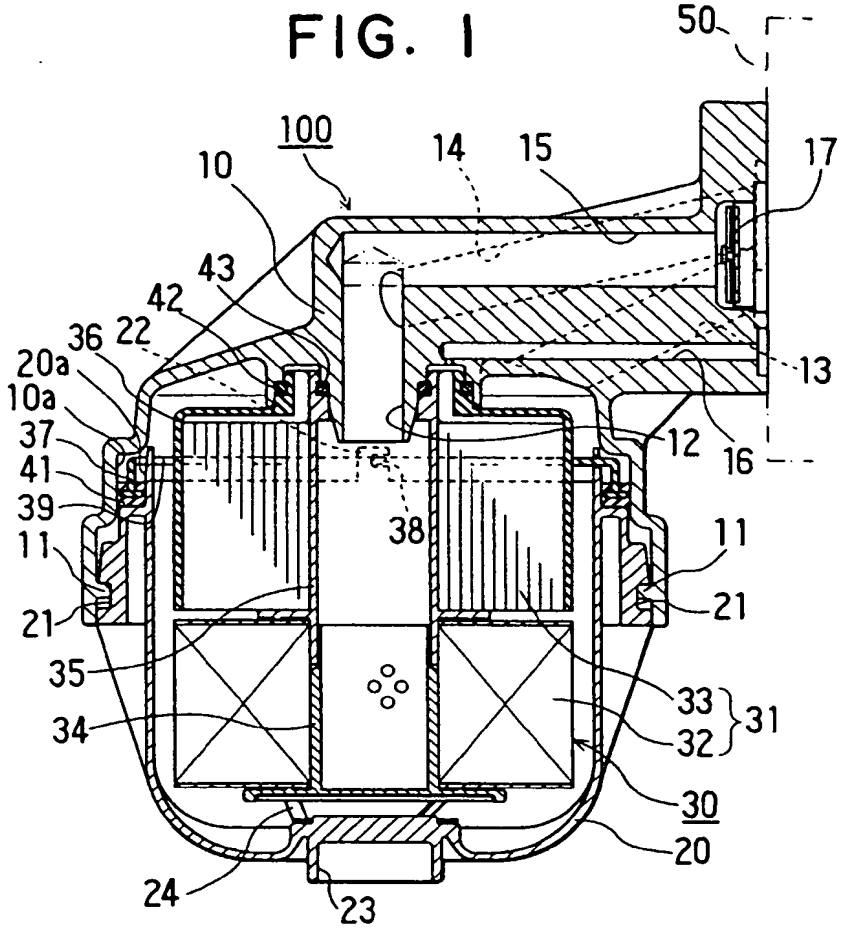


FIG. 2

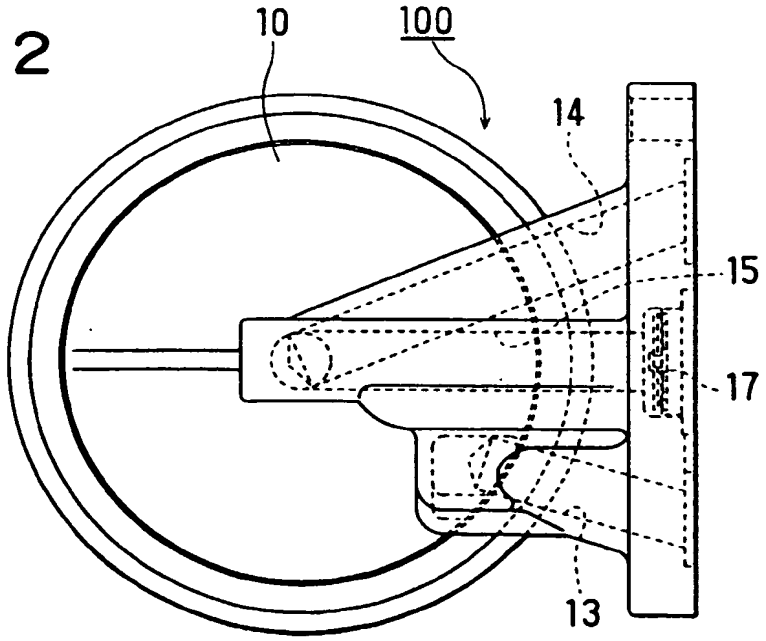


FIG. 3A

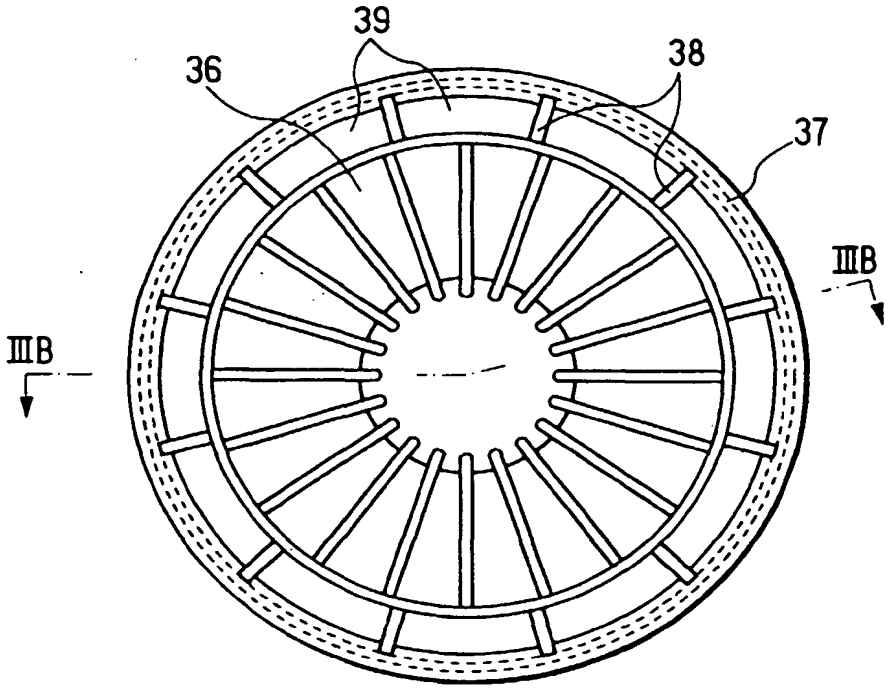


FIG. 3B

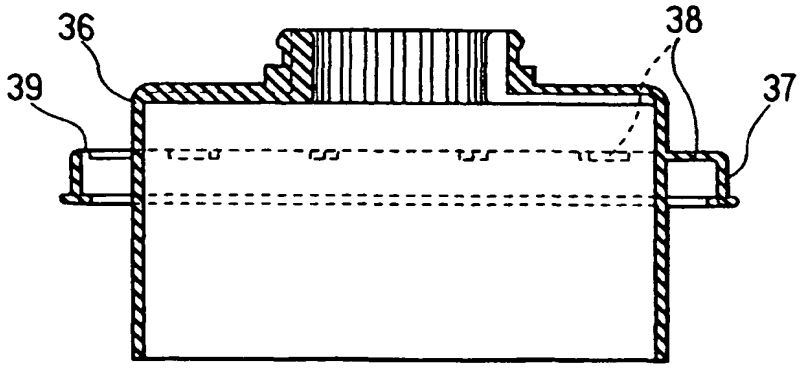


FIG. 4

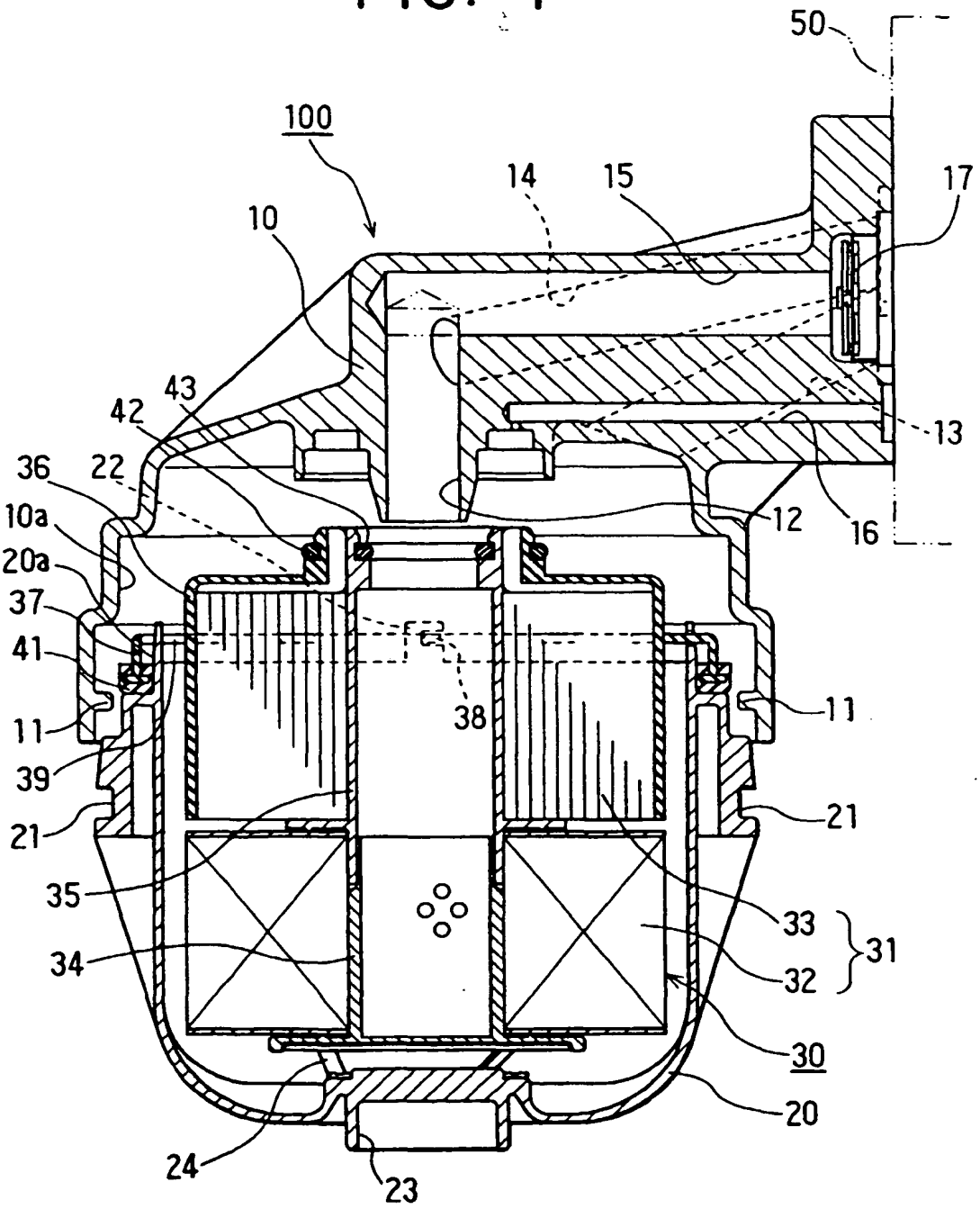


FIG. 5

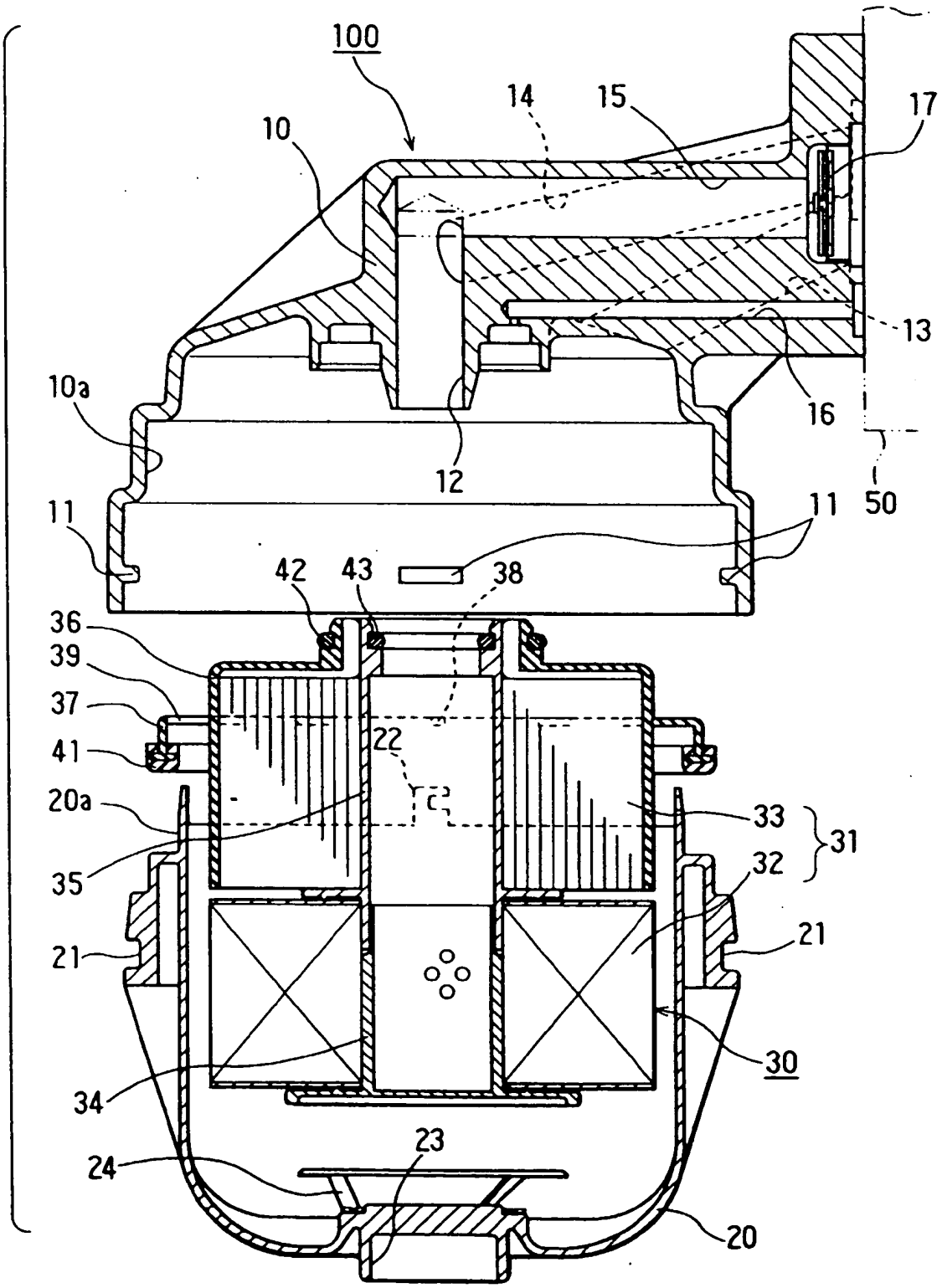


FIG. 6

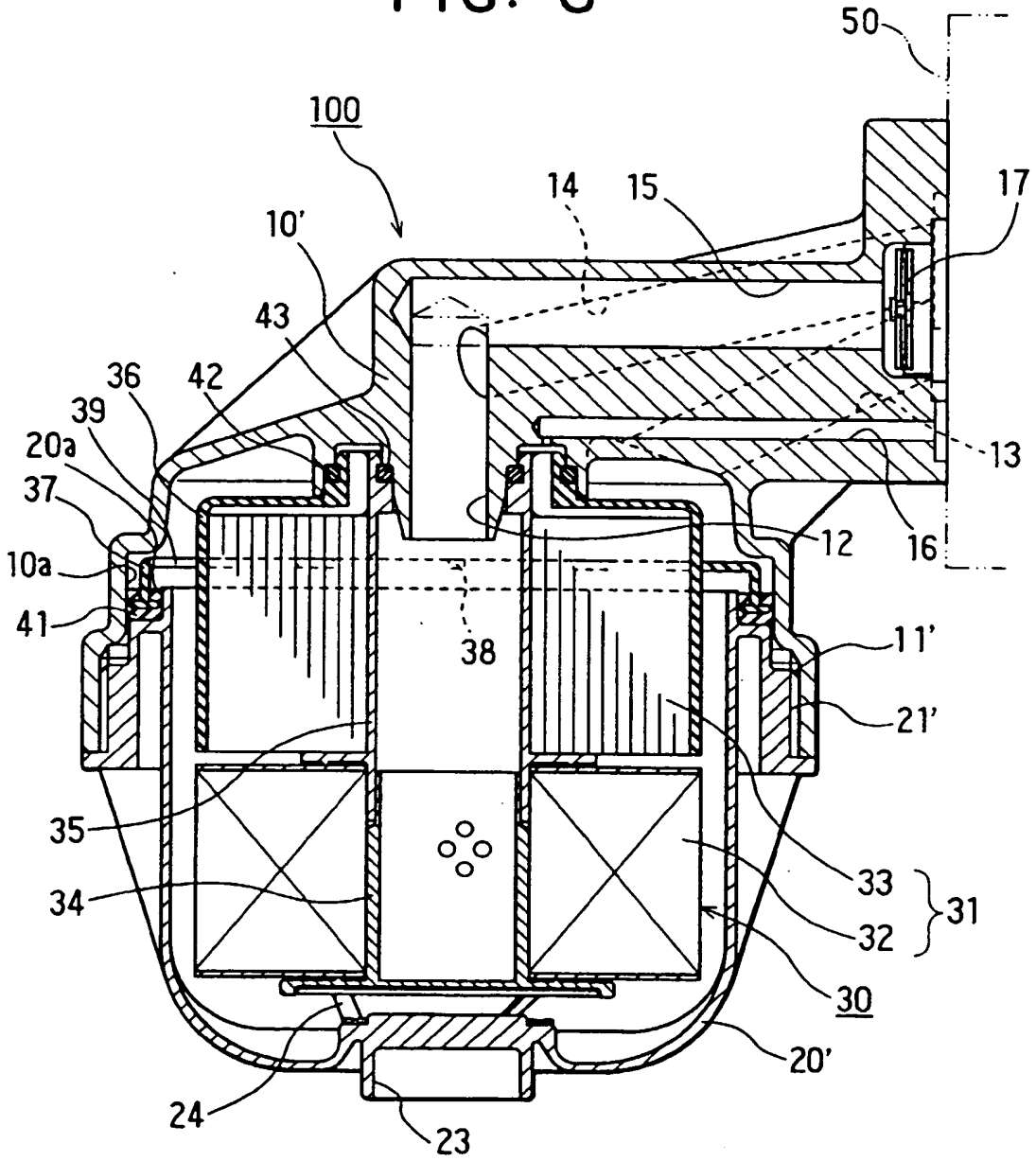


FIG. 7

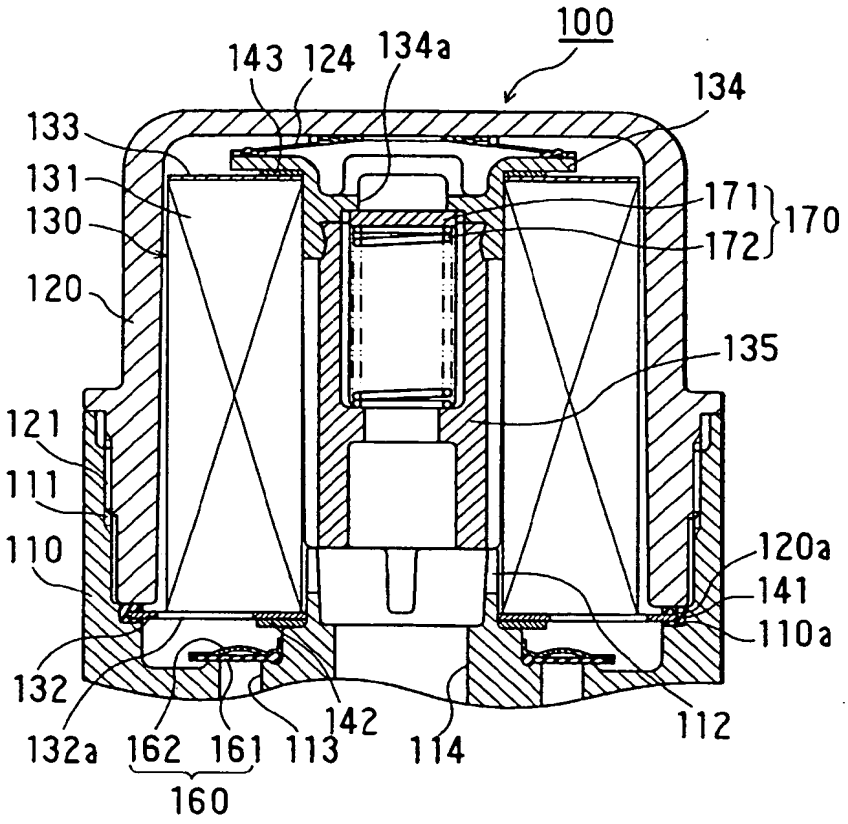


FIG. 8

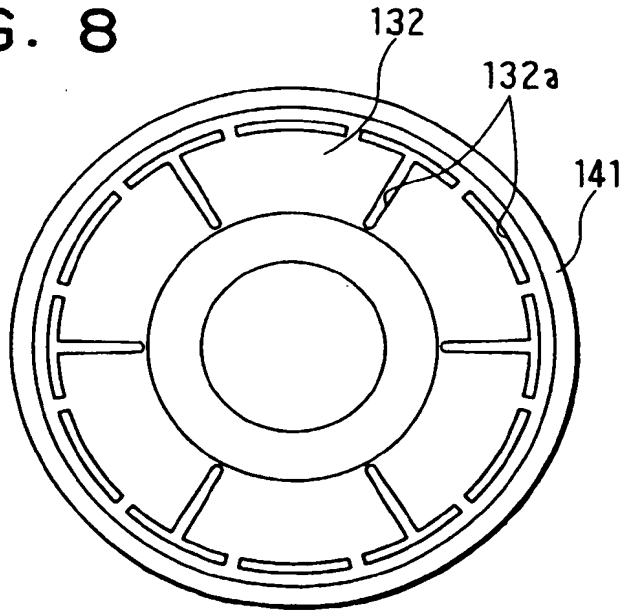


FIG. 9

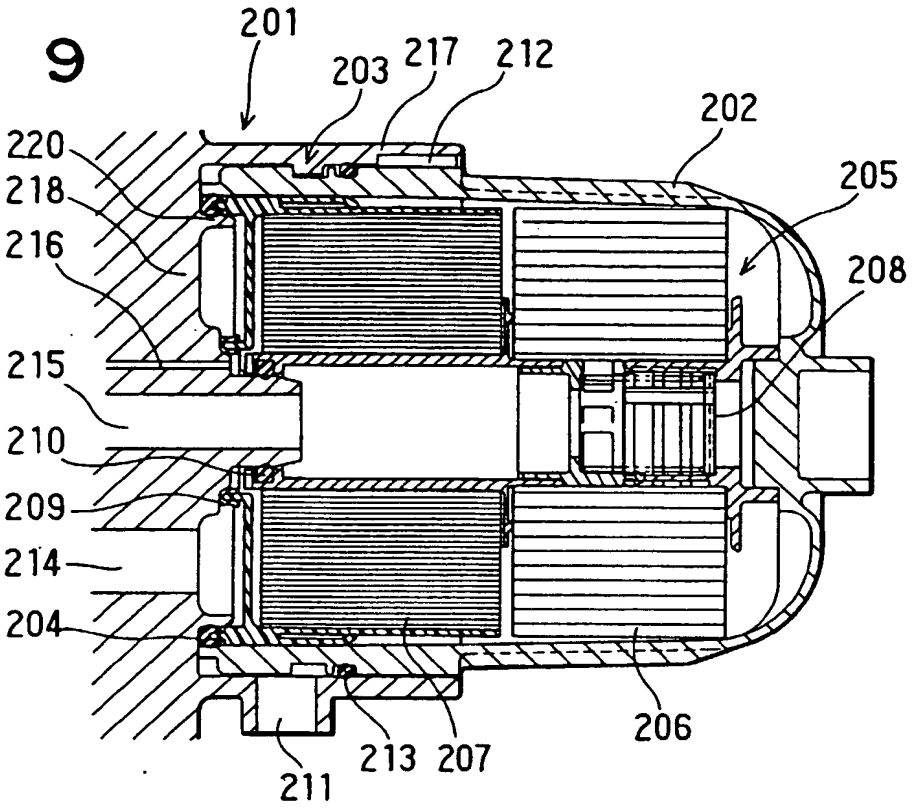


FIG. 10

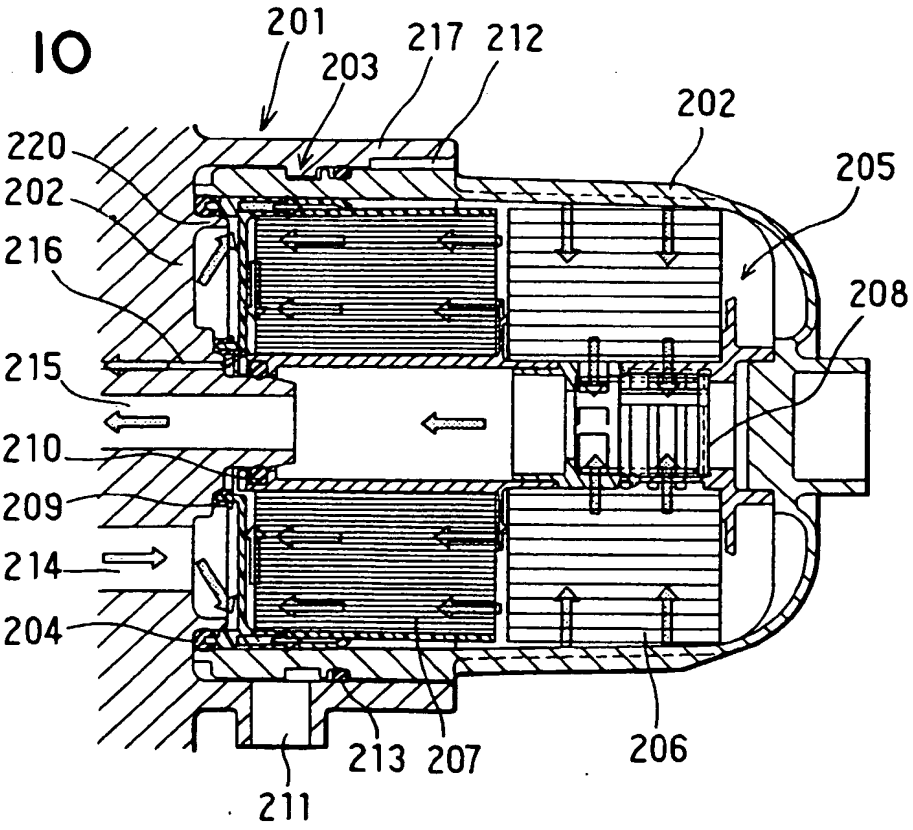
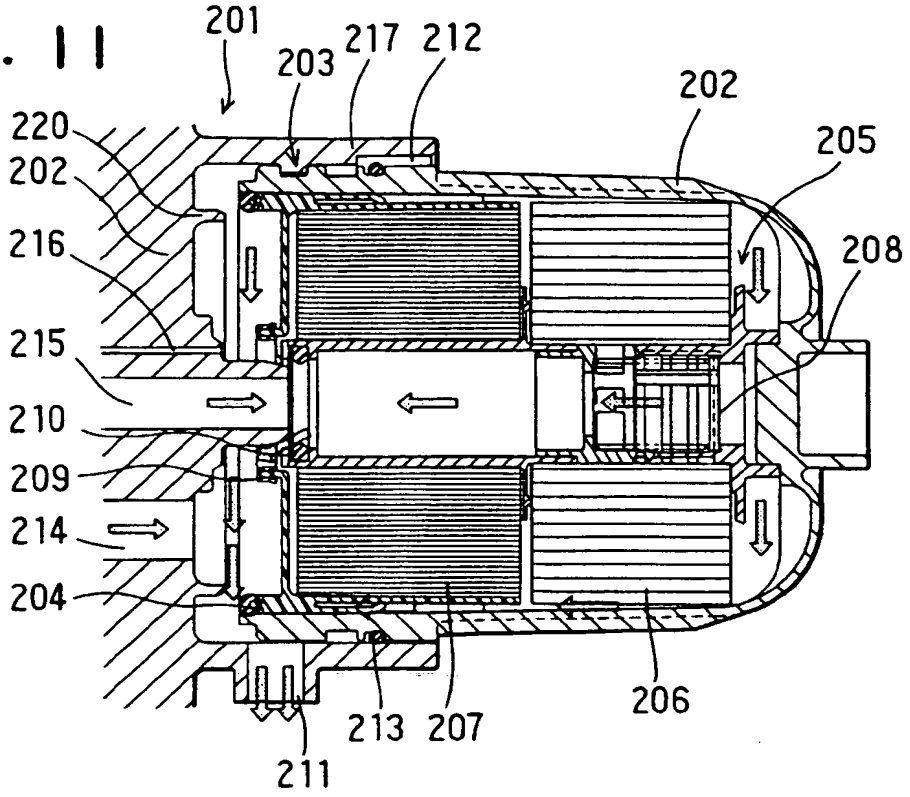


FIG. 11



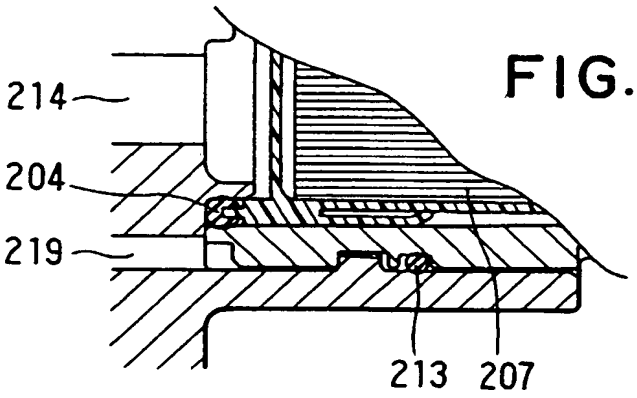


FIG. 12

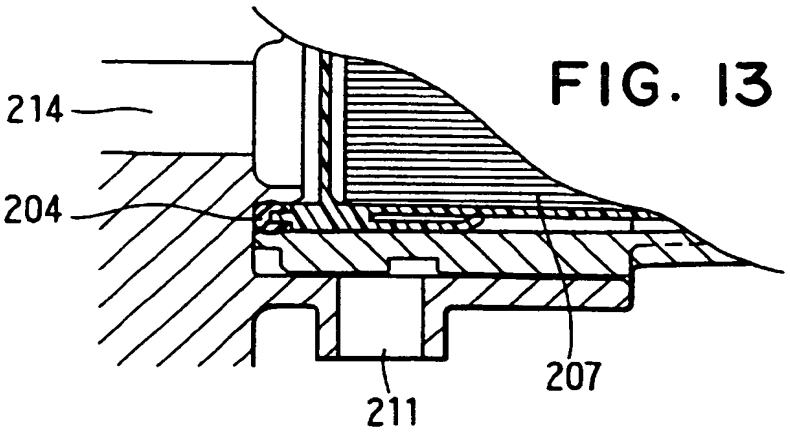


FIG. 13

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 844 012 A3

(12) EUROPEAN PATENT APPLICATION

(88) Date of publication A3:
06.05.1999 Bulletin 1999/18

(43) Date of publication A2:
27.05.1998 Bulletin 1998/22

(21) Application number: **97118188.8**

(22) Date of filing: **20.10.1997**

(51) Int. Cl.[6]: **B01D 27/08**, B01D 35/30

(84) Designated Contracting States:
AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV RO SI

(30) Priority: **20.11.1996 JP 309078/96**
09.07.1997 JP 183521/97

(71) Applicant: **DENSO CORPORATION**
Kariya-City Aichi-Pref. 448 (JP)

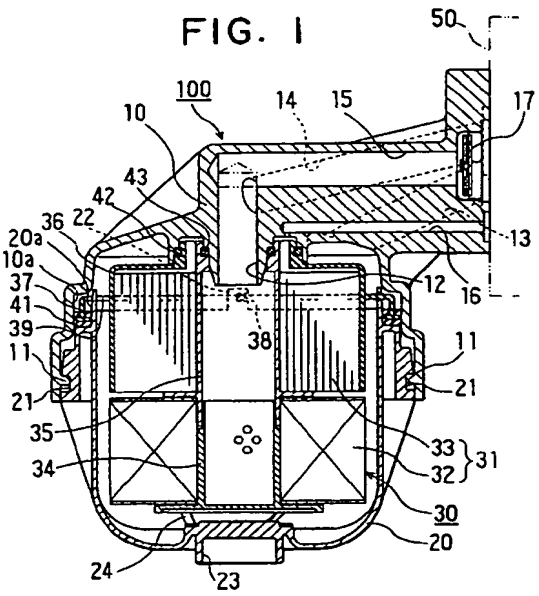
(72) Inventors:
- **Fukumori, Sadahito**
  Kariya-city, Aichi-pref. 448 (JP)
- **Tomita, Masahiro**
  Kariya-city, Aichi-pref. 448 (JP)
- **Yonemoto, Tosiyuki**
  Kariya-city, Aichi-pref. 448 (JP)
- **Ueda, Hiroshi**
  Kariya-city. Aichi-pref. 448 (JP)

(74) Representative:
Pellmann, Hans-Bernd, Dipl.-Ing.
Patentanwaltsbüro
Tiedtke-Bühling-Kinne & Partner
Bavariaring 4
80336 München (DE)

(54) Filter element assembly and element-replaceable type filter equipped with the same

(57) An element-replaceable type filter (100) comprises a base (10, 110) and a cap (20, 120) for accommodating therein an element assembly (30, 130) having a filter element (31, 131) and removably engageable with each other. When replacing the element assembly, the cap is demounted from the base together with the element assembly. At this time, a gasket (41, 141) for maintaining the base and the cap liquid-tightly is also demounted together with the filter element. This construction simplifies the replacing work and reduces failure of mounting the gasket between the base and the cap. The base has a drain port (211) for draining fluid therethrough when the cap is loosened from the base for replacement of the filter element assembly.

FIG. 1



EP 0 844 012 A3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 97 11 8188

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	EP 0 442 365 A (STANADYNE AUTOMOTIVE CORP) 21 August 1991 * column 5, line 37 - line 56; figures 2,4 * ---	1-6	B01D27/08 B01D35/30
X	EP 0 702 144 A (BOSCH GMBH ROBERT) 20 March 1996 * column 4, line 15 - column 5, line 22; figures 1,2 * ---	1-6	
X	EP 0 269 895 A (BOSCH GMBH ROBERT) 8 June 1988 * column 3, line 21 - line 50; claim 1; figures 1-3 * ---	1,3	
X	DE 43 30 839 A (HENGST WALTER GMBH & CO KG) 16 March 1995 * column 3, line 15 - column 4, line 16; figure 1 * -----	11,12, 16,17	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6) B01D F02M

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	12 March 1999	Hild, U

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 97 11 8188

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

12-03-1999

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0442365 A	21-08-1991	US 5035797 A	30-07-1991
		DE 69105539 D	19-01-1995
		DE 69105539 T	13-07-1995
		ES 2067059 T	16-03-1995
		JP 7054728 A	28-02-1995
EP 0702144 A	20-03-1996	DE 4432529 A	14-03-1996
		DE 59501154 D	05-02-1998
		ES 2110805 T	16-02-1998
EP 0269895 A	08-06-1988	DE 3641348 A	16-06-1988
		JP 2086014 C	23-08-1996
		JP 7114895 B	13-12-1995
		JP 63143912 A	16-06-1988
DE 4330839 A	16-03-1995	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82